MARKED UP VERSION OF REPLACED PARAGRAPHS OF THE SPECIFICATION

Page 1, first full paragraph (lines 3 and 4), the marked up paragraph is as follows:

[A] The present invention relates to a steel strip descaling apparatus and a steel strip manufacturing apparatus using the descaling apparatus.

Page 1, third full paragraph, (lines 10-13), the marked up paragraph is as follows:

The Japanese patent Laid-open No. 3-56699 describes pumping an electrolyte to a steel strip submerged in the electrolyte from the hole of an electrolyte in order to prevent the steel strip from waving.

Page 1, fifth full paragraph, (lines 17-23), the marked up paragraph is as follows: Page 1, third full paragraph, (lines 10-13), the marked up paragraph is as follows:

3. [Summry] SUMMARY

However, in the art of No. 3-56699, because electrolyte and an electric conductor do not contact each other directly, a large quantity of electrolyte is necessary. The apparatus is large because of a large electrolyte bath. [And because]

However, in the art of No. 3-56699, because electrolyte and an electric conductor do not contact each other directly, a large quantity of electrolyte is necessary. The apparatus is large because of a large electrolyte bath. [And because] As the electrodes are also located in the electrolyte, a third disadvantage of this prior art technique is that short circuits occur among the electrodes through the electrolyte.

Page 2, third full paragraph, (lines 10-14), the marked up paragraph is as follows:

To achieve[s] the above purpose, a feature of the present invention is that electrodes have jet openings which jet the electrolyte to the steel strip, that is to say, the electrode is integrated with the nozzle which jets an electrolyte.

Page 2, fifth full paragraph, (lines 19-23), the marked up paragraph is as follows:

[Acceding] According to a feature of the present invention, it is possible to reduce the size of an electrolyte tank storing the electrolyte, because the quantity of an electrolyte decreases by jetting the electrolyte in the air. Therefore, the descaling apparatus is miniaturized.

Pages 2 and 3, the paragraph bridging these pages from page 2, line 24 through page 3, line 2, the marked up paragraph is as follows:

In [contact] contrast to the conventional art [submerging steel strip, because a] wherein the steel to be treated is submerged in the electrolyte, the present invention's use of jetting means for jetting the electrolyte onto the steel strip obviates immersion of the steel strip and the occurrence of short-circuit electric current [through an electrolyte] between the electrodes [decreases, the] , thus improving electric power efficiency [improves].

Page 3, the fourth full paragraph, lines 12-14, the marked up paragraph is as follows:

Another feature[s] of the present invention is that the descaling apparatus further has [jet pressure] force adjustment of the jetted electrolyte.

Page 3, the fifth full paragraph, lines 15-17, the marked up paragraph is as follows:

By adjusting the [jet pressure] force of the jetted electrolyte, the waving and the flexure of the steel strip is prevented, and we can arrange the electrodes close to the steel strip.

Page 3, the sixth full paragraph, lines 18-21, the marked up paragraph is as follows:

Because the electrodes are moved closer to the steel strip, a voltage drop between the electrodes and the steel strip becomes lower, and the electric power for the descaling can be decreased [decreases].

Pages 3 and 4, the paragraph bridging these pages from page 3, line 22 through page 4, line 2, the marked up paragraph is as follows:

By using the above-mentioned [the] descaling apparatus, the steel strip manufacturing apparatus [improves the] attains an improvement in electric power efficiency and the processing speed, and the manufacturing apparatus becomes small.

Page 5, the first full paragraph, lines 4 - 9, the marked up paragraph is as follows:

The rolled steel strip 1 passes through the cooling hearth 5 and passes through the neutral salt solution electrolysis part 6 that is the first electrolysis part. In the neutral salt solution electrolysis part 6, with the neutral salt solution 20 (shown in Fig. 2) as a sulfate sodium solution, [a] chrome oxide is eliminated.

Page 7, the second full paragraph, line 6, the marked up paragraph is as follows:

Fig. [2] 3A shows the anode 23 of Fig. 1 in detail.

Page 8, the first full paragraph, lines 9-16, the marked up paragraph is as follows:

We have brought the anodes 23 and the cathodes 24 as close as 1 cm to the steel strip 1 in practice. The distance is 1/10 or less as compared with the conventional electrolysis submerging steel strip. As a result, the electrolytic efficiency improves 65 - 95 % or more compared with the prior art. Therefore, we reduce the voltage from 20V to 7V or less to obtain the [sane] same electric current density of 20A/cm^2 as the prior art.

Page 9, the second full paragraph, lines 18-22, the marked up paragraph is as follows:

The positive charged part of the steel strip 1 between the cathodes 24 locally becomes an anode 33 (Fig. 2), and on the anode 33 chrome oxide in the oxide film ionizes according to the chemical reaction (1) and dissolves in the neutral salt solution 20.

Page 12, the third full paragraph, lines 9-16, the marked up paragraph is as follows:

After these [processings] processes, the steel strip 43 passes through the descaling apparatus 47 in Fig. 4B, which has the structural details of Fig. 2, 3A and 3B. The descaling apparatus 47 has a hydrochloride electrolysis part 48 using hydrochloric acid 49 as an electrolyte. In hydrochloride electrolysis pat 48, the cathodes 24 are arranged in a first upstream half, and the anodes 23 are arranged in the latter downstream half.

Pages 14 and 15, the paragraph bridging page 14, lines 18-26 through page 15, line 1, the marked up paragraph is as follows:

Another example of the electrodes 23, 24 is explained with respect to Fig. 5. A conductor 29 is placed at a electrolytic [way] passage way 34, and an electric insulating material 30 covers an end of the electrodes 23, 24. As Fig. 5B show, the electric insulating material 30 surrounds the conductor 29, which surrounds the electrolytic passage way 34. The electric insulating material 30 prevent a discharge between the electrodes and the steel strip when the electrodes 23, 24 contact the steel strip and we can protect the steel strip against damage by the discharge.

Page 15, the first full paragraph, lines 2-4, the marked up paragraph is as follows:

Other examples of [powers and] jet force adjustment by electrolyte pressure adjustments are explained with respect to Fig. 6, which shows an arrangement of them on one side of the steel strip.

Page 15, the second full paragraph, lines 5-9, the marked up paragraph is as follows:

Each electrode 23 (or 24) connects a pressure adjustment element 35 and every pressure adjustment[s connect] element is connected to a controller 36 which controls [each pressure adjustement] the respective pressures. Each electrode 23 (or 24 is also [connects a power 25 and every powers connect] connected to a power supply 25 and a controller 37 [which] controls [each power] the power for each power supply, respectively.

MARKED UP VERSION OF REPLACED ABSTRACT OF THE DISCLOSURE

This invention relates to an improved apparatus and method for electrolytic descaling of steel strips. The apparatus comprises electrodes integrated with nozzles having jet openings for dispensing electrolyte onto the surface of the steel strips. By jetting the electrolyte to the steel strip in the air and applying a voltage to the electrode, the scale on the surface of the steel strip is removed. This jetting of electrolyte reduces the size requirement of the electrolyte tank storing the electrolyte because the required quantity of electrolyte decreases. The present invention does not require immersion of the electrodes in the electrolyte and thus avoids the problem of short-circuiting that occurs with submerged electrodes. This results in a significant improvement in electric power efficiency. By individually adjusting the jet pressure of the electrolyte jets, the waving and the flexure of the steel strip is prevented and the electrodes can be arranged close to the steel strip to reduce required electric power. With the reduction in short circuit currents, many electrodes can be provided and the speed of the descaling can be increased as a result of the increase in electric current to the steel strip.

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ABSTRACT OF THE DISCLOSURE

This invention relates to an improved apparatus and method for electrolytic descaling of steel strips. The apparatus comprises electrodes integrated with nozzles having jet openings for dispensing electrolyte onto the surface of the steel strips. By jetting the electrolyte to the steel strip in the air and applying a voltage to the electrode, the scale on the surface of the steel strip is removed. This jetting of electrolyte reduces the size requirement of the electrolyte tank storing the electrolyte because the required quantity of electrolyte decreases. The present invention does not require immersion of the electrodes in the electrolyte and thus avoids the problem of short-circuiting that occurs with submerged electrodes. This results in a significant improvement in electric power efficiency. By individually adjusting the jet pressure of the electrolyte jets, the waving and the flexure of the steel strip is prevented and the electrodes can be arranged close to the steel strip to reduce required electric power. With the reduction in short circuit currents, many electrodes can be provided and the speed of the descaling can be increased as a result of the increase in electric current to the steel strip.